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10/091,946	03/07/2002	Laurent Launay	14XZ00152	7091

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EXAMINER	
MISTRY, O NEAL RAJAN	

ART UNIT	PAPER NUMBER
2625	

DATE MAILED: 10/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/091,946	LAUNAY ET AL.	
	Examiner	**Art Unit**	
	O'Neal R. Mistry	2625	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on 07 March 2002.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-29 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) 1-6,13-16,18-21,24-27 and 29 is/are rejected.

7)☒ Claim(s) 7-12,17,22,23 and 28 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 07 March 2002 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

The response received on 07/05/2005 has been placed in the file and was considered by the examiner. An action on the merits follows.

Response to Arguments

The arguments filed on 07/05/2005 have been fully considered. A response to these arguments is proved below.

Summary of Arguments:

1. Applicant alleges rejection for 112, First Paragraph should be considered to be traversed..

2. Applicant alleges that Azuma does not teach the claimed radiographic masked model that is particular to radiography.

3. Applicant alleges that Watanable does not teach the claimed radiographic subtracted model that is particular to radiography.

4. Applicant alleges Harms does not teach merging the radiograph masked model and the radiographic subtracted model that are both particular to radiography.

5. Applicant alleges that there is a lack of motivation to combine references to establish a proper rejection of obviousness.

Examiner's Response:

1. The examiner after reviewing remarks on page 9 & 10, maintains the rejection for 112, First Paragraph, for the reason that the applicant in the specification has not

disclosed "weighting law". The paragraphs [37] & [38], cited by the applicant, does not even disclose the word "weight", or even a connection to variable, Yb. In addition, after reviewing the specification for Yb, the examiner interprets the Yb as a linear function, and not a "weighting law". The examiner does not understand the meaning of "weighting law", therefore the rejection is maintained.

2. The examiner respectfully disagrees, that Azuma does not teach the claimed radiograph masked model that is particular to radiography, because after reviewing Azuma the examiner concluded that the system examines 3-D images of calcified elements. The examiner interprets the claim limitation in the broadest form, which is a 3-D model image that contains calcium or any other implanted element that is called masked model. Azuma discloses a 3-D model image of bone structure (col. 2 lines 40-46), which bone is construe to have calcium, that reads on the claim limitation in the broadest form. In addition, the Azuma also uses tomographic images (col. 2 line 45). The definition of tomographic image, by www.onelook.com, is 3-D images of body structure that uses a wave energy or x-ray waves to constructed the image, which is considered by the examiner to be a form of radiographic imaging.

3. The examiner respectfully disagrees, that Watanable does not teach the claimed radiographic subtracted model that is particular to radiography, because after reviewing Watanable the examiner concludes that the system constructs a 3-D image of vascular elements (col. 7 lines 9-30). The examiner interprets the claim limitation in the broadest form, which is a 3-D model image that contains only vascular element that is called subtracted model. Watanable discloses a system for determining the 3-D image that

contains vessels by using contrasting agent inserted into the blood to display the vascular system (col. 5 lines 43-65). The examiner interprets; Watanable states that the system develops a 3-D model of the vascular system (Figure 1 item 307 & Figure 4 item 407), which concluded by the examiner reads on the claim limitation.

In addition, the applicant's remark states that Watanabe does not teach, "radiographic subtracted model that is particular to radiography", in contrast to MR imaging as well as NMR as stated by Watanable. Since, examiner cannot find the limitation of " radiographic subtracted model that is particular to radiography" within the claim limitation, the examiner interprets that 3-dimensional model can be achieved by a variety of systems. If the applicant requests that the examiner interprets "radiographic subtracted model that is particular to radiography" claim limitation into the claim, the examiner respectfully invites the applicant to first insert the limitation into the claim for interpretation purposes.

4. The examiner respectfully disagrees, that Harms does not teach merging the radiograph masked model and the radiographic subtracted model that are both particular to radiography, because after reviewing Harms the system mergers the mask model, which is the 3-D image of knee, ankle, or hips, with subtracted model, which is 3-D image of vascular images (col. 10 lines 25-30). The examiner respectfully request the applicant review the citied column and lines again, because Harms takes the calcium model image of the knee, which the examiner considers to be mask model, combines the image with vascular images, which the examiner considers to be the

subtracted model, to create a 3-D image that includes both the mask and subtracted model.

5. In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, the examiner finds the Azuma and Watanable are from the same field of endeavor i.e. bio-medical imaging in 3-Diminsions (col. 7 lines 10-25, Watanable) (col. 9 lines 15-30, Azuma). The suggestion/motivation for doing so would have been to develop a system that has the ability to image veins, arteries, and bones in distinguishable manner (col. 2 lines 40-45), as taught by Watanable. In conclusion, examiner finds Azuma and Watanable to be combinable because the system can find image a variety of different elements within the human body.

In addition, the examiner finds Azuma and Watanable and Harms are combinable because they are from the same field of endeavor i.e. bio-medical imaging in 3-D. (col. 7 lines 10-25, Watanable) (col. 9 lines 15-30, Azuma) & (col. 11 lines 10-15, Harms). The suggestion/motivation for doing so would have been to one of ordinary skill in the art to combine all the systems because it would yield 3-D volumetric image, to

view multiple elements within the a single 3-D image (col. 10 lines 30-37), as taught by Harms.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 4-12 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The examiner after reviewing the specification cannot understand the meanings of "weighting law" stated in the claim 4 line 2, claim 5 line 2, claim 6 line 2, claim 7 line 2, claim 8 line 2, and claim 9 line 2. Within the description the applicant makes no note of "weighting law", and the examiner can interpret the meaning for weighting law as gravity on the human body, or a function rule.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-6, 13-16, 18-21, 24-27, 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Azuma et al (U.S. Patent Number 6,839,457) in view of Watanabe (U.S. Patent Number 6,760,611) in further view of Harms et al (U.S. Patent Number 5,415,163).

In regards to claim 1, Azuma teaches a system for measure bone shape, structure, and architecture. In addition, Azuma discloses determine from a three-dimensional modeling a three-dimensional model known as the masked model, which features a calcified element and an implanted element, but not a vascular element (col. 2 lines 54-60) [Thus, the present invention enables the more accurate evaluation of the three-dimensional bone-related information than those by other methods, because the separated cortical bone portion three-dimensional image and the separated cancellous bone portion three-dimensional image can non-invasively and

automatically be extracted at a high speed in good repeatability.]

Azuma does not expressly disclose determine a three-dimensional model known as the subtracted model, which features the vascular elements alone; merging the two models, weighting their voxels so as to increase the contrast between the images of the masked model and the images of the subtracted model; and summing the voxels thus weighted.

However, Watanabe teaches a system to view blood vessels in the body, and produce a 3D image. In addition, Watanabe discloses determine a three-dimensional model known as the subtracted model, which features the vascular elements alone (col. 1 lines 41-48) [Utilizing this fact, NMR measurement of the region is conducted while the contrast agent remains in the blood, of the region concerned, and the obtained three-dimensional image data are processed to image the blood vessel.]

Azuma & Watanabe are combinable because they are from the same field of endeavor i.e. bio-medical imaging in 3-Diminsions (col. 7 lines 10-25, Watanable) (col. 9 lines 15-30, Azuma).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine and incorporate the teachings taught by Watanable into the system of Azuma.

The suggestion/motivation for doing so would have been to develop a system that has the ability to image veins, arteries, and bones in distinguishable manner (col. 2 lines 40-45), as taught by Watanable.

Therefore, it would have been obvious to combine Azuma and Watanabe.

Azuma and Watanabe does not expressly disclose merging the two models, weighting their voxels so as to increase the contrast between the images of the masked model and the images of the subtracted model; and summing the voxels thus weighted.

However, Harms teaches a system to diagnose and treating tissue suspected of containing a lesion by utilizing 3D images of bone samples, and blood samples similar to that of Azuma and Watanabe. In addition, Harms further teaches merging the two models, weighting their voxels so as to increase the contrast between the images of the masked model and the images of the subtracted model (col. 10 lines 25-30, Note that the system is combining the musculoskeletal with the vascular images to create a new image with both models.) [For example, image data from diagnostic examinations of musculoskeletal masses and bone marrow abnormalities can be used in the reconstructed slice method or combined with image processing to render three dimensional viewing, lesion specific analysis, and/or vascular images.] and summing the voxels thus weighted (col.3 lines 19-24 & col. 14 lines 31-37, Note that when the system combines the two models, the system must look a the magnetism of the voxel understand the signals, and the T1 weighting for image contrast, to add the image together) [When a group of protons precess in phase, the voxel

gives off a maximum signal. When a group of protons precess out of phase, the voxel gives off no signal.] & [a useful amount of T1 weighting and improved image contrast due to the holding of magnetization in the transverse plane. It is contemplated that this embodiment of the invention would be useful for increasing the signal from blood].

Azuma and Watanabe & Harms are combinable because they are from the same field of endeavor i.e. bio-medical imaging in 3-D. (col. 7 lines 10-25, Watanable) (col. 9 lines 15-30, Azuma) & (col. 11 lines 10-15, Harms).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine and incorporate the teachings taught by Harms into the system of Azuma and Watanabe.

The suggestion/motivation for doing so would have been to one of ordinary skill in the art to combine all the systems because it would yield 3-D volumetric image, to view multiple elements within the a single 3-D image (col. 10 lines 30-37), as taught by Harms.

Therefore, it would have been obvious to combine Azuma and Watanabe & Harms, to obtain the invention as specified in claim 1.

In regards to claim 2 , Azuma and Watanabe and Harms discloses the masked image is filtered by removing therefrom any voxel intensities which are below a given threshold (col. 6 lines 1-5 & col. 6 lines 41-46, '457, Note the examiner interprets the claim, as the voxels are removed if the intensities are below the a certain threshold. The

prior art states the luminance value which is translated to "voxel intensities", the threshold is used to remove data that falls below the threshold, as in the Figures 3 & 4. Figure 3 is filtered and produces Figure 4, a much clear form of the image.) [In the discriminating analysis method, it is assumed that the group of luminance values is divided into two classes with a threshold in the histogram of the luminance values of images, and the threshold is determined so that the distribution ratio (f.sub.0) of the equation 1 is maximized using the interclass distribution] & [and the numerical characters of 0 were assigned to the smaller luminance values than the threshold to binarize the luminance values, whereby the binary image was obtained. FIG. 4 shows a binary image (hereinafter referred to as "binary original image") obtained by binarizing the original image of FIG. 3. From FIG. 4, it is found that the distinctions of the space portion 23 from the cortical portion 21 and the cancellous portion 22 are clear.].

In regards to claim 3, Azuma and Watanabe and Harms discloses the weighting is applied to the voxels after filtering (col. 3 lines 10-15, '611) [Each of the NMR signal groups is capable of producing a two-dimensional image or three-dimensional image. The obtained NMR signal groups may be subjected to subtraction and cumulative addition or weighted

addition after each is reconstructed into image data or may be subjected to a subtraction as measured complex signals.].

In regards to claim 4 , Azuma and Watanabe and Harms discloses the voxels of the masked image are weighted by applying to them a weighting law which over at least one range of voxel intensities (col. 5 lines 30-40,'611, Note the weighted addition is used in a function to represent the image. & col. 6 lines 37-47, '457, Note the in Figure 3 is the original image, and then is converted into a Figure 4 which shows a much clearer contrast of original image, and also the luminance values are assigned to a threshold to be displayed.) [In addition, the signal processing unit 7 of the MRI apparatus of the present invention is provided with a function of performing subtraction and weighted addition for image data as a function of the CPU 8.] & [The numerical characters of 1 were assigned to the larger luminance values than the threshold, and the numerical characters of 0 were assigned to the smaller luminance values than the threshold to binarize the luminance values, whereby the binary image was obtained. FIG. 4 shows a binary image (hereinafter referred to as "binary original image") obtained by binarizing the original image of FIG. 3. From FIG. 4, it is found that the distinctions of the space portion 23 from the cortical portion 21 and the cancellous portion 22 are clear.], is a linear function of the intensity (Figure 28).

It would have been obvious to one of ordinary skill in the art, having the teachings Azuma and Watanabe and Harms before him at the time the invention was made, to modify the combining from one image to another image taught by Azuma to include the weighted addition for the image data to be displayed on the screen of Watanabe, to further include the combining of a skeletal model with a vascular model taught by Harms, in order to obtain that uses the luminance values with weighted addition image data as a function to combine two different models.

One would have been motivated to make such a combination because it would allow a much more clear image that would display fine detail in 3D of the skeletal and vascular model in determining proper diagnosis for the patient would have been obtained, as taught by Harms.

In regards to claim 5, Azuma and Watanabe and Harms discloses the voxels of the masked image are weighted by applying to them a weighting law which over at least one range of voxel intensities (col. 5 lines 30-40,'611, Note the weighted addition is used in a function to represent the image. & col. 6 lines 37-47, '457, Note the in Figure 3 is the original image, and then is converted into a Figure 4 which shows a much clearer contrast of original image, and also the luminance values are signed a threshold to be displayed.) [In addition, the signal processing unit 7 of the MRI apparatus of the present invention is provided with a function of performing subtraction and weighted addition for image data as a function of the CPU 8.] & [The numerical characters of 1 were assigned to the larger luminance values than the threshold, and

the numerical characters of 0 were assigned to the smaller luminance values than the threshold to binarize the luminance values, whereby the binary image was obtained. FIG. 4 shows a binary image (hereinafter referred to as "binary original image") obtained by binarizing the original image of FIG. 3. From FIG. 4, it is found that the distinctions of the space portion 23 from the cortical portion 21 and the cancellous portion 22 are clear.], is a linear function of the intensity (Figure 28).

It would have been obvious to one of ordinary skill in the art, having the teachings Azuma and Watanabe and Harms before him at the time the invention was made, to modify the combining from one image to another image taught by Azuma to include the weighted addition for the image data to be displayed on the screen of Watanabe, to further include the combining of a skeletal model with a vascular model taught by Harms, in order to obtain that uses the luminance values with weighted addition image data as a function to combine two different models.

One would have been motivated to make such a combination because it would allow a much more clear image that would display fine detail in 3D of the skeletal and vascular model in determining proper diagnosis for the patient would have been obtained, as taught by Harms..

In regards to claim 6, Azuma and Watanabe and Harms discloses the voxels of the masked image are weighted by applying to them a weighting law which over at least one range of voxel intensities (col. 5 lines 30-40,'611, Note the weighted addition is

used in a function to represent the image. & col. 6 lines 37-47, '457, Note the in Figure 3 is the original image, and then is converted into a Figure 4 which shows a much clearer contrast of original image, and also the luminance values are signed a threshold to be displayed.) [In addition, the signal processing unit 7 of the MRI apparatus of the present invention is provided with a function of performing subtraction and weighted addition for image data as a function of the CPU 8.] & [The numerical characters of 1 were assigned to the larger luminance values than the threshold, and the numerical characters of 0 were assigned to the smaller luminance values than the threshold to binarize the luminance values, whereby the binary image was obtained. FIG. 4 shows a binary image (hereinafter referred to as "binary original image") obtained by binarizing the original image of FIG. 3. From FIG. 4, it is found that the distinctions of the space portion 23 from the cortical portion 21 and the cancellous portion 22 are clear.], is a linear function of the intensity (Figure 28).

It would have been obvious to one of ordinary skill in the art, having the teachings Azuma and Watanabe and Harms before him at the time the invention was made, to modify the combining from one image to another image taught by Azuma to include the weighted addition for the image data to be displayed on the screen of Watanabe, to further include the combining of a skeletal model with a vascular model

taught by Harms , in order to obtain that uses the luminance values with weighted addition image data as a function to combine two different models.

One would have been motivated to make such a combination because it would allow a much more clear image that would display fine detail in 3D of the skeletal and vascular model in determining proper diagnosis for the patient would have been obtained, as taught by Harms.

In regards to claim 13, Azuma and Watanabe and Harms discloses the voxels of the subtracted model are weighted by applying to them a coefficient which is the ratio between a value that corresponds to a desired mean value for the voxels of the model in the merged model and a mean value that is calculated over the voxels in the subtracted model (col. 2 line 65- col. 3 line 3, '611, Note that weight coefficient is used for the determining the correct image of the vascular system.) [In the addition operation, each of the subtracted NMR signal groups is weighted using a weighting coefficient. The weighting coefficient is determined based on the signal intensity of the NMR signal group difference. Weighting coefficients having different signs are used.].

In regards to claims 14, Azuma and Watanabe and Harms discloses the mean value is calculated by determining the limits of the vessels or vessel portions and by calculating the mean value in the region thus determined (col. 11 lines 65- col. 12 lines 11 '611, Note the examiner interprets that the mean value is the intensity of the vessels. The prior art states steps on the re-produce a 3D image. The image takes

measurement over time and subtracts the measurements and then adds the values to create an image, in Figure 12. Figure 13 illustrates a group of vessels of a single vessel in Figure 12.).

In regards to claim 15, Azuma and Watanabe and Harms discloses the mean value is calculated by determining portions of straight lines which constitute the main directions of a vessel and by calculating the mean value over these straight lines portions (Figure 13, Note after the calculation of the data computed, the projected blood vessel image is produced, which is determining portions of straight and curved lines within the vessels. In addition to Figure 13, the system is also calculating the direction of the blood vessels, but adding the all the projections, which is time based.).

In regards to claim 16, Azuma and Watanabe and Harms discloses the anatomical region that it is desired to view is selected beforehand (col. 4 lines 29-37, '163, Note the examiner interprets that prior art must be used in a region where the patient is suspected of having a lesion, so the examiner interprets that is a form of selecting a region beforehand.) [In one embodiment, the present invention is of a method of removing a lesion from surrounding healthy tissue using a therapeutic delivery system. Multiple shaped RF pulse sequences are generated and a series of echoes are received in response thereto. A real-time MR image of tissue is produced from the series of received echoes and the produced real-time MR image is utilized to determine boundaries between the lesion and surrounding healthy tissue.], the masked model and the

subtracted model and the merged model being determined for the region (col. 10 lines 25-30, '163, Note that the system is combining the musculoskeletal with the vascular images to create a new image with both models.) [For example, image data from diagnostic examinations of musculoskeletal masses and bone marrow abnormalities can be used in the reconstructed slice method or combined with image processing to render three dimensional viewing, lesion specific analysis, and/or vascular images.].

In regards to claim 18, Azuma teaches a system for measure bone shape, structure, and architecture. In addition, Azuma discloses determine from a three-dimensional modeling a three-dimensional model known as the masked model, which features a calcified element and an implanted element, but not a vascular element (col. 2 lines 54-60) [Thus, the present invention enables the more accurate evaluation of the three-dimensional bone-related information than those by other methods, because the separated cortical bone portion three-dimensional image and the separated cancellous bone portion three-dimensional image can non-invasively and automatically be extracted at a high speed in good repeatability.]

.Azuma does not expressly disclose determine a three-dimensional model known as the subtracted model, which features the vascular elements alone; merging the two models, weighting their voxels so as to increase the contrast between the images of the masked model and the images of the subtracted model; and summing the voxels thus weighted.

However, Watanabe teaches a system to view blood vessels in the body, and produce a 3D image. In addition, Watanabe discloses determine a three-dimensional model known as the subtracted model, which features the vascular elements alone (col. 1 lines 41-48) [Utilizing this fact, NMR measurement of the region is conducted while the contrast agent remains in the blood, of the region concerned, and the obtained three-dimensional image data are processed to image the blood vessel.]

Azuma & Watanabe are combinable because they are from the same field of endeavor i.e. bio-medical imaging in 3-Diminsions (col. 7 lines 10-25, Watanable) (col. 9 lines 15-30, Azuma).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine and incorporate the teachings taught by Watanable into the system of Azuma.

The suggestion/motivation for doing so would have been to develop a system that has the ability to image veins, arteries, and bones in distinguishable manner (col. 2 lines 40-45), as taught by Watanable.

Therefore, it would have been obvious to combine Azuma and Watanabe.

Azuma and Watanabe does not expressly disclose merging the two models, weighting their voxels so as to increase the contrast between the images of the masked model and the images of the subtracted model; and summing the voxels thus weighted.

However, Harms teaches a system to diagnose and treating tissue suspected of containing a lesion by utilizing 3D images of bone samples, and blood samples similar to that of Azuma and Watanabe. In addition, Harms further teaches merging the two models, weighting their voxels so as to increase the contrast between the images of the masked model and the images of the subtracted model (col. 10 lines 25-30, Note that the system is combining the musculoskeletal with the vascular images to create a new image with both models.) [For example, image data from diagnostic examinations of musculoskeletal masses and bone marrow abnormalities can be used in the reconstructed slice method or combined with image processing to render three dimensional viewing, lesion specific analysis, and/or vascular images.] and summing the voxels thus weighted (col.3 lines 19-24 & col. 14 lines 31-37, Note that when the system combines the two models, the system must look a the magnetism of the voxel understand the signals, and the T1 weighting for image contrast, to add the image together) [When a group of protons precess in phase, the voxel gives off a maximum signal. When a group of protons precess out of phase, the voxel gives off no signal.] & [a useful amount of T1 weighting and improved image contrast due to the holding of magnetization in the transverse plane. It is contemplated that

this embodiment of the invention would be useful for increasing the signal from blood].

Azuma and Watanabe & Harms are combinable because they are from the same field of endeavor i.e. bio-medical imaging in 3-D. (col. 7 lines 10-25, Watanable) (col. 9 lines 15-30, Azuma) & (col. 11 lines 10-15, Harms).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine and incorporate the teachings taught by Harms into the system of Azuma and Watanabe.

The suggestion/motivation for doing so would have been to one of ordinary skill in the art to combine all the systems because it would yield 3-D volumetric image, to view multiple elements within the a single 3-D image (col. 10 lines 30-37), as taught by Harms.

Therefore, it would have been obvious to combine Azuma and Watanabe & Harms, to obtain the invention as specified in claim 18.

In regards to claim 19, Azuma and Watanabe and Harms discloses the masked image is filtered by removing therefrom any voxel intensities which are below a given threshold (col. 6 lines 1-5 & col. 6 lines 41-46, '457, Note the examiner interprets the claim, as the voxels are removed if the intensities are below the a certain threshold. The prior art states the luminance value which is translated to "voxel intensities", the threshold is used to remove data that falls below the threshold, as in the Figures 3 & 4. Figure 3 is filtered and produces Figure 4, a much clear form of the image.) [In the

discriminating analysis method, it is assumed that the group of luminance values is divided into two classes with a threshold in the histogram of the luminance values of images, and the threshold is determined so that the distribution ratio (f.sub.0) of the equation 1 is maximized using the interclass distribution] & [and the numerical characters of 0 were assigned to the smaller luminance values than the threshold to binarize the luminance values, whereby the binary image was obtained. FIG. 4 shows a binary image (hereinafter referred to as "binary original image") obtained by binarizing the original image of FIG. 3. From FIG. 4, it is found that the distinctions of the space portion 23 from the cortical portion 21 and the cancellous portion 22 are clear.].

In regards to claim 20, Azuma and Watanabe and Harms discloses the weighting is applied to the voxels after filtering (col. 3 lines 10-15, '611) [Each of the NMR signal groups is capable of producing a two-dimensional image or three-dimensional image. The obtained NMR signal groups may be subjected to subtraction and cumulative addition or weighted addition after each is reconstructed into image data or may be subjected to a subtraction as measured complex signals.].

In regards to claim 21, Azuma and Watanabe and Harms discloses the voxels of the masked image are weighted by applying to them a weighting law which over at least

one range of voxel intensities (col. 5 lines 30-40,'611, Note the weighted addition is used in a function to represent the image. & col. 6 lines 37-47, '457, Note the in Figure 3 is the original image, and then is converted into a Figure 4 which shows a much clearer contrast of original image, and also the luminance values are assigned to a threshold to be displayed.) [In addition, the signal processing unit 7 of the MRI apparatus of the present invention is provided with a function of performing subtraction and weighted addition for image data as a function of the CPU 8.] & [The numerical characters of 1 were assigned to the larger luminance values than the threshold, and the numerical characters of 0 were assigned to the smaller luminance values than the threshold to binarize the luminance values, whereby the binary image was obtained. FIG. 4 shows a binary image (hereinafter referred to as "binary original image") obtained by binarizing the original image of FIG. 3. From FIG. 4, it is found that the distinctions of the space portion 23 from the cortical portion 21 and the cancellous portion 22 are clear.], is a linear function of the intensity (Figure 28).

It would have been obvious to one of ordinary skill in the art, having the teachings Azuma and Watanabe and Harms before him at the time the invention was made, to modify the combining from one image to another image taught by Azuma to include the weighted addition for the image data to be displayed on the screen of Watanabe, to further include the combining of a skeletal model with a vascular model

taught by Harms, in order to obtain that uses the luminance values with weighted addition image data as a function to combine two different models.

One would have been motivated to make such a combination because it would allow a much more clear image that would display fine detail in 3D of the skeletal and vascular model in determining proper diagnosis for the patient would have been obtained, as taught by Harms.

In regards to claim 24, Azuma and Watanabe and Harms discloses the voxels of the subtracted model are weighted by applying to them a coefficient which is the ratio between a value that corresponds to a desired mean value for the voxels of the model in the merged model and a mean value that is calculated over the voxels in the subtracted model (col. 2 line 65- col. 3 line 3, '611, Note that weight coefficient is used for the determining the correct image of the vascular system.) [In the addition operation, each of the subtracted NMR signal groups is weighted using a weighting coefficient. The weighting coefficient is determined based on the signal intensity of the NMR signal group difference. Weighting coefficients having different signs are used.].

In regards to claim 25, Azuma and Watanabe and Harms discloses the mean value is calculated by determining the limits of the vessels or vessel portions and by calculating the mean value in the region thus determined (col. 11 lines 65- col. 12 lines 11 '611, Note the examiner interprets that the mean value is the intensity of the vessels. The prior art states steps on the re-produce a 3D image. The image takes

measurement over time and subtracts the measurements and then adds the values to create an image, in Figure 12. Figure 13 illustrates a group of vessels of a single vessel in Figure 12.).

In regards to claim 26, Azuma and Watanabe and Harms discloses the mean value is calculated by determining portions of straight lines which constitute the main directions of a vessel and by calculating the mean value over these straight lines portions (Figure 13, Note after the calculation of the data computed, the projected blood vessel image is produced, which is determining portions of straight and curved lines within the vessels. In addition to Figure 13, the system is also calculating the direction of the blood vessels, but adding the all the projections, which is time based.).

In regards to claim 27, Azuma and Watanabe and Harms discloses the anatomical region that it is desired to view is selected beforehand (col. 4 lines 29-37, '163, Note the examiner interprets that prior art must be used in a region where the patient is suspected of having a lesion, so the examiner interprets that is a form of selecting a region beforehand.) [In one embodiment, the present invention is of a method of removing a lesion from surrounding healthy tissue using a therapeutic delivery system. Multiple shaped RF pulse sequences are generated and a series of echoes are received in response thereto. A real-time MR image of tissue is produced from the series of received echoes and the produced real-time MR image is utilized to determine boundaries between the lesion and surrounding healthy tissue.], the masked model and the

subtracted model and the merged model being determined for the region (col. 10 lines 25-30, '163, Note that the system is combining the musculoskeletal with the vascular images to create a new image with both models.) [For example, image data from diagnostic examinations of musculoskeletal masses and bone marrow abnormalities can be used in the reconstructed slice method or combined with image processing to render three dimensional viewing, lesion specific analysis, and/or vascular images.].

In regards to claim 29, Azuma and Watanabe and Harms discloses the masked model comprises a radiographic masked model (col. 1 lines 5-10, Note the examiner interprets that tomographic imaging as radiographic); and the subtracted model comprises a radiographic subtracted model (col. 2 lines 45-50, Note the examiner interprets that RF as radiographic).

Allowable Subject Matter

Claims 7-12, 17, 22, 23 & 28 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

In regards to claims 7 & 22, the prior art does not teach the voxels of the masked model are weighted by applying to them a weighting law which, outside of the voxel intensity range, increases less markedly than the linear function of intensity used for the intensity range.

In regards to claim 8, the prior art does not teach the voxels of the masked model are weighted by applying to them a weighting law which, outside of the voxels intensity range, increases less markedly than the linear function of intensity used for the intensity range.

In regards to claim 9, the prior art does not teach the voxels of the masked model are weighted by applying to them a weighting law which, outside of the voxel intensity range, increases less markedly than the linear function of intensity used for the intensity range.

In regards to claims 10 & 23, the prior art does not teach the weighting law used outside of the intensity range is a function which, give or take a multiplication factor, corresponds to the square root function.

In regards to claim 11, the prior art does not teach the weighting law used outside of the intensity range is a function which, give or take a multiplication factor, corresponds to the square root function.

In regards to claim 12, the prior art does not teach the weighting law used outside of the intensity range is a function which, give or take a multiplication factor, corresponds to the square root function.

In regards to claim 17 & 28, the prior art does not teach the merged model is produced by pointing to the portion or portions of vessels that the user wishes to view and automatically determining the limits of this or these portion or portions of vessels.

The prior art does not teach the modeling of the voxel outside the linear function and does not teach the use of the function of multiplication factor, corresponding to the square root. The prior art uses another method for displaying voxel on the screen.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to O'Neal R. Mistry whose telephone number is (703) 305-4675. The examiner can normally be reached on 9am - 6pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh M. Mehta can be reached on (703) 308-5246. The fax phone

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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